



UNIVERSITY OF SASKATCHEWAN
MIDTERM EXAMINATION

EE 486.3/402.3 Microwave Engineering

Professor: Dr. D. M. Klymyshyn

February 28, 2002

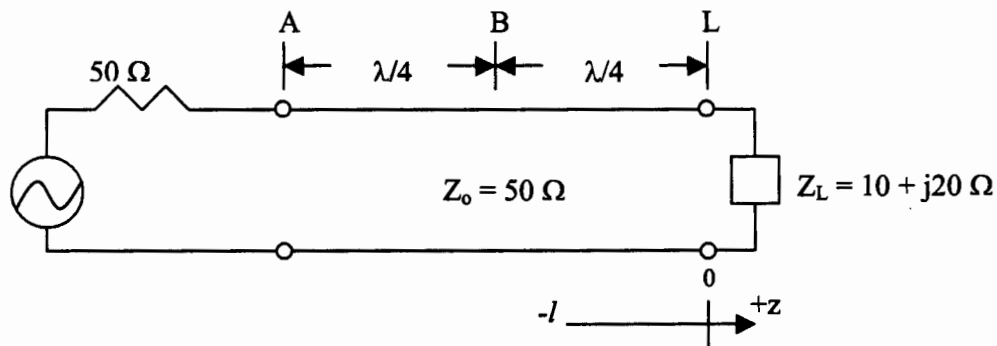
Time: 80 minutes

Notes: One formula sheet is allowed.
2-port parameter conversion sheet is allowed.
All 3 questions are of equal value.
Assume all transmission lines are lossless.

1. A microwave circuit is shown. The power available from the source (P_{avs}) is 0 dBm. Using **transmission line equations** (not the Smith Chart), find the following:

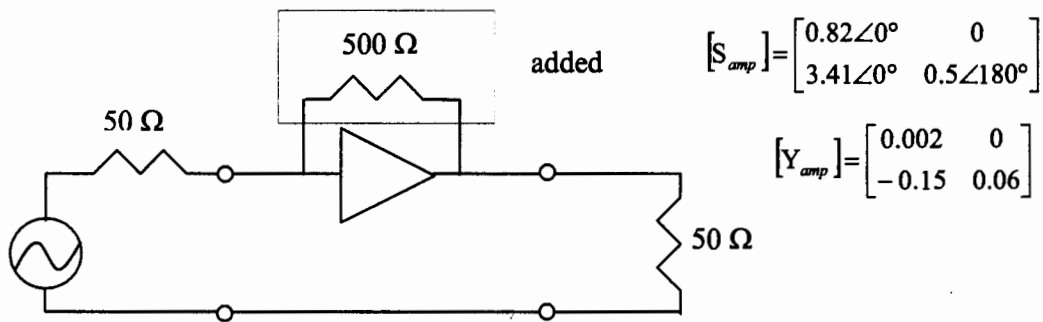
a. $|V|$ at points A, B, and L.

b. Average power at points A, B, and L using $\frac{1}{2} \left| \frac{V(-l)}{Z(-l)} \right|^2 \text{Re}(Z(-l))$.



2. The $[S]$ parameters of the amplifier **alone** as measured in a $50\ \Omega$ system are given. A resistor is added to the amplifier as shown. Does this **increase** or **decrease** the **power gain** (note: **not** voltage gain) of the overall 2-port network and by how much?

(HINTS: The power gain of a 2-port network with source and load terminated in Z_o is $20 \log |S_{21}|$. $[Y]$ parameters of the amplifier **alone** are also given.)



3. Design an **open circuit single shunt** stub tuner to match a $100\ \Omega$ load to a $50\ \Omega$ line. The stub should be as **close as possible** to the load. Use $50\ \Omega$ transmission lines for the tuner. Include the **Smith Chart** provided with your solution, **clearly** marking all constructions.